MC

HKSYCIA WONG TAI SHAN MEMORIAL COLLEGE

MATHEMATICS Compulsory Part
2nd TERM EXAMINATION 2019-2020
PAPER II
Time allowed: 1 hour 15 minutes

SETTER: YPK

Instructions

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first insert the information required in the spaces provided.

2. When told to open this book, you should check that all the questions are there. Look for the words '**END OF PAPER**' after the last questions.

3. This paper contains 14 pages

4. All questions carry equal marks.

5. **ANSWER ALL QUESTIONS.** You should mark all the answers on the Answer Sheet.

6. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

7. No marks will be deducted for wrong answers.

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There are 30 questions in Section A and 15 questions in Section B.
The diagrams in this paper are not necessarily drawn to scale.
Choose the best answer for each question.

Section A

1. Simplify $\dfrac{(5a^{-4}b^{2})^{-1}}{(-ab^{-1})^{-3}}$ and express your answer with positive indices.

   A. $-\dfrac{b^2}{5a^2}$

   B. $\dfrac{5b^2}{a^2}$

   C. $-\dfrac{a^7}{5b^5}$

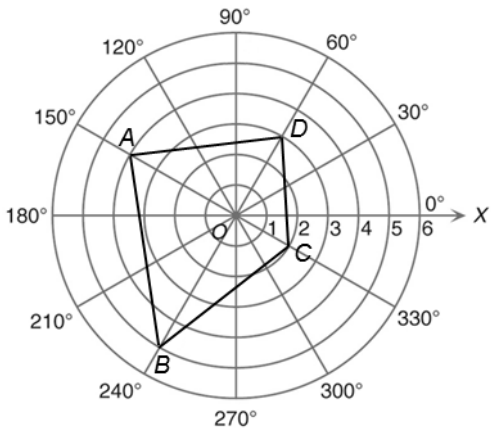
   D. $\dfrac{5a^7}{b^5}$

2. A hamburger shop promotes a new hamburger. Customers who buy the new hamburger can buy a second hamburger at half price. What is the overall discount per cent if Clara buys 2 such hamburgers?

   A. 20%
   B. 25%
   C. 50%
   D. 75%

3. The figure shows a quadrilateral *ABCD* on a polar coordinate plane. Find the area of *ABCD*.

   A. 20 sq. units
   B. 24 sq. units
   C. 36 sq. units
   D. 48 sq. units



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4. If N is a positive integer, which of the following must be an odd number?

I. 2^N

II. $2^{3N-1}+1$

III. $2^N(2^{3N-1}+1)$

A. II only

B. I and II only

C. I and III only

D. II and III only

5. Solve the equation $x+2=(x-3)(x+2)$.

A. $x=3$

B. $x=4$

C. $x=-2$ or $x=3$

D. $x=-2$ or $x=4$

6. Solve the equation $3x^2+6x-5=0$.

A. $x=\dfrac{-5\pm\sqrt{129}}{10}$

B. $x=\dfrac{5\pm\sqrt{129}}{10}$

C. $x=\dfrac{-3\pm2\sqrt{6}}{3}$

D. $x=\dfrac{3\pm2\sqrt{6}}{3}$

7. Which of the following is the largest domain of real numbers for the function $y=\dfrac{1}{3x-7}$?

A. The set of all real numbers

B. $x\le\dfrac{7}{3}$, where x is a real number

C. $x\ge0$, where x is a real number

D. $x\ne\dfrac{7}{3}$, where x is a real number

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8. If $f(x) = 4x^2 + 3kx + 1$ and $f(x) = f(-x)$ where k is a constant, then $f(7) =$

A. 176.
B. 190.
C. 197.
D. 205.

9. If $\begin{cases} \beta = \alpha^2 + 2 \\ \beta = 5\alpha - 2 \end{cases}$, then $\alpha =$

A. 0 or 5.
B. 0 or –5.
C. 1 or 4.
D. –1 or –4.

10. Solve the equation $2ax(2 - ax) + ax = 2$, where $a \neq 0$.

A. $x = 0$
B. $x = \dfrac{1}{2a}$
C. $x = \dfrac{1}{2a}$ or $\dfrac{2}{a}$
D. $x = 2a$ or a

11. If β is a root of the equation $3x^2 + 2x - 3 = 0$, then $6\beta^2 + 4\beta - 7 =$

A. 0.
B. −1.
C. 4.
D. –4.

12. Find the equation of the perpendicular bisector of the line segment joining A (–6, 4) and B (3, 9).

A. $5x - 9y - 46 = 0$
B. $5x - 9y + 66 = 0$
C. $9x + 5y - 19 = 0$
D. $9x - 5y - 51 = 0$

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13. Two straight lines $L_1 : ax - by + 5 = 0$ and $L_2 : 6x - 3y + 7 = 0$ do not intersect. If another straight line $L_3 : 5x + 4y - 10 = 0$ has the same y-intercept as L_1, find the values of a and b.
    A. $a = -1, b = 2$
    B. $a = 2, b = -1$
    C. $a = 2, b = 4$
    D. $a = 4, b = 2$

14. Find the remainder when $19x - 14x^2 + 3x^3 - 6$ is divided by $3 - 4x + x^2$.
    A. $2x + 12$
    B. $2x - 6$
    C. $2x$
    D. $3x - 2$

15. When $(kx + 2)(x + 1)$ is divided by $x - 2$, the remainder is 12. Find the value of k.
    A. –5
    B. –2
    C. 2
    D. 1

16. When $2x^3 + mx^2 - 8x + n$ is divided by $2x + 1$ where m and n are constants, the quotient is $x^2 - 4$ and the remainder is 9. Find the values of m and n.
    A. $m = -1, n = 5$
    B. $m = -1, n = -13$
    C. $m = 1, n = 5$
    D. $m = 1, n = -13$

17. Let $h(x) = x^2 + mx + n$. When $h(x)$ is divided by $x - 1$, the remainder is 1. If $h(x)$ is divisible by $x - 2$, find the value of m.
    A. 4
    B. –4
    C. 2
    D. –2

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18. When a polynomial $f(x)$ is divided by $2x + 1$, the remainder is R. Find the remainder when $f(2x + 1)$ is divided by $4x + 3$.

A. R

B. $\frac{2}{3}R$

C. $4R$

D. $4R + 3$

19. If $x^2 + 5x - 6$ is a factor of a polynomial $f(x)$, which of the following must be true?

A. $f(-2) = f(-3) = 0$

B. $f(2) = f(3) = 0$

C. $f(-1) = f(6) = 0$

D. $f(1) = f(-6) = 0$

20. Factorize $3x^3 + 8x^2 - 15x + 4$.

A. $(x + 1)(x - 2)(3x + 2)$

B. $(x - 1)^2(3x + 4)$

C. $(x - 1)(x + 4)(3x - 1)$

D. $(x - 1)(x - 4)(3x + 1)$

21. If $8^{3x} = 32^{2y}$ and x, y are non-zero integers, then $x : y =$

A. 2 : 3.

B. 3 : 2.

C. 9 : 10.

D. 10 : 9.

22. Solve the equation $4^{x+1} - 3(2^{2x}) = 64$.

A. 8

B. 6

C. 4

D. 3

23. If $y \propto \sqrt{x}$, and $y = 10$ when $x = 4$, find the value of x when $y = 5$.

A. –1

B. 1

C. –2

D. 2

Go on to the next page

24. It is given that $(y+1)$ varies inversely as the square of x, where $x>0$. When $x=2$, $y=224$. Find the value of x when $y=35$.

A. 5

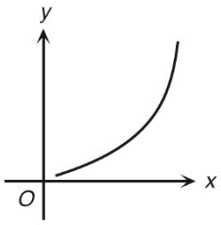
B. 6

C. 25

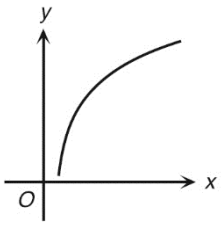
D. 36

25. It is given that y varies inversely as x^2. Which of the following graphs shows this relation?

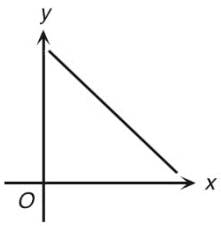
A.



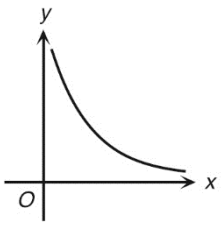
B.



C.



D.



26. If $x : y = 1 : 2$ and $y : z = 3 : 2$, which of the following must be true?

I. x varies inversely as y.

II. y varies directly as z.

III. z varies directly as x.

A. I only

B. III only

C. I and II only

D. II and III only

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27. If a varies directly as $\sqrt{b}$ and inversely as c^2, then which of the following must be a constant?

A. $\dfrac{a\sqrt{b}}{c^2}$

B. $\dfrac{\sqrt{b}c^2}{a}$

C. $\dfrac{\sqrt{b}}{ac^2}$

D. $a\sqrt{b}c^2$

28. The monthly operating cost (\$$C$) of a company is partly constant and partly varies directly as the number of employees (n) in the company. The monthly operating cost is \$60 000 when there are 4 employees and the monthly operating cost is \$75 000 when there are 6 employees. Find the percentage change in the monthly operating cost if the number of employees in the company is increased from 8 to 10.

A. $+16\dfrac{2}{3}\%$

B. $-16\dfrac{2}{3}\%$

C. +20%

D. –20%

29. It is given that y varies inversely as x^2 where $x \neq 0$. If x increases by 50%, then y

A. decreases by 25%.

B. decreases by 50%.

C. decreases by $55\dfrac{5}{9}\%$.

D. increases by 50%.

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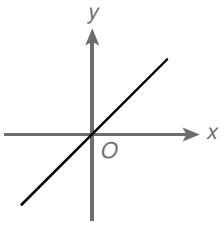
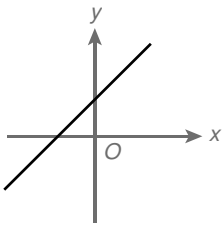
30. Which of the following graphs shows that $y \propto (2x+1)$?

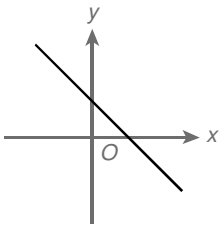
A.



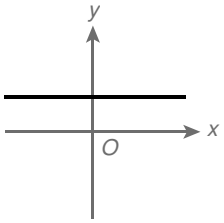
B.



C.



D.



Section B

31. If $\alpha \neq \beta$ and $\begin{cases} \alpha^2 - 5\alpha - 4 = 0 \\ \beta^2 - 5\beta - 4 = 0 \end{cases}$, find the value of $(\alpha - 1)(\beta - 1)$.

A. –8
B. 0
C. 2
D. 10

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32. Which of the following about the algebraic expressions $b^2(a + b)$ and $b(a + b)^2$ is/are true?

I. b is a common factor of the two given expressions.

II. The H.C.F. of the two expressions is $b(a + b)^2$.

III. The L.C.M. of the two expressions is $b^2(a + b)^2$.

A. I only

B. I and II only

C. I and III only

D. II and III only

33. $\dfrac{x}{x^2-6x+5}\times\dfrac{x^2-2x+1}{2x+10}\div\dfrac{3x}{x^2-25}=$

A. $\dfrac{x}{6}$

B. $\dfrac{1}{6}$

C. $\dfrac{x-1}{6}$

D. $\dfrac{x(x-1)}{6}$

34. If $3^x-3^{-x}=m$ where x is an integer and m is a constant, then $9^x+9^{-x}=$

A. m^2+2.

B. m^2-2.

C. $2m^2+1$.

D. $2m^2-1$.

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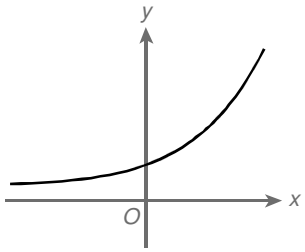
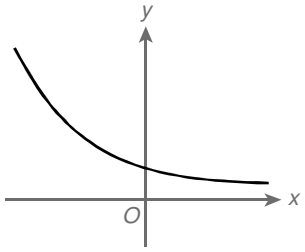
35. It is given that a is a positive constant. Which of the following is / are not the graph(s) of $y = a^x$?

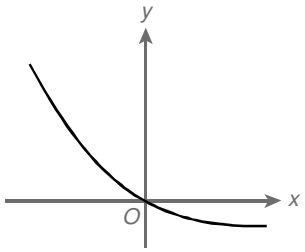
I.



II.



III.



A. II only
B. III only
C. I and III only
D. II and III only

36. If $\log 4 = a$ and $\log 9 = b$, then $\log \frac{15}{2} =$

A. $\frac{b+2}{2a}$.
B. $\sqrt{b} - 1 - a$.
C. $\frac{b}{2} + 1 - a$.
D. $\frac{b}{2} - 1 - a$.

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37. If $0.49^m = 49^n = 10\,000$, then $\frac{1}{m} - \frac{1}{n} =$

A. 100.

B. $-\frac{1}{2}$.

C. $\frac{1}{2}$.

D. $\frac{1}{100}$.

38. Which of the following has the greatest value?

A. $600^{4\,500}$

B. $2\,400^{3\,600}$

C. $3\,600^{2\,400}$

D. $4\,500^{600}$

39. Simplify $\frac{3\log\sqrt{x} + \frac{1}{3}\log x}{\log\sqrt{x} - \log x^2}$, where $x > 0$ and $x \neq 1$.

A. $-\frac{11}{4}$

B. $-\frac{11}{9}$

C. $\frac{11}{4}$

D. $\frac{11}{9}$

40. If $\frac{1}{2}\log x^3 = 1 + \log 4y$, express x in terms of y.

A. $x = [2(1+4y)]^{\frac{1}{3}}$

B. $x = (1+8y)^{\frac{1}{3}}$

C. $x = (1+4y)^{\frac{2}{3}}$

D. $x = (40y)^{\frac{2}{3}}$

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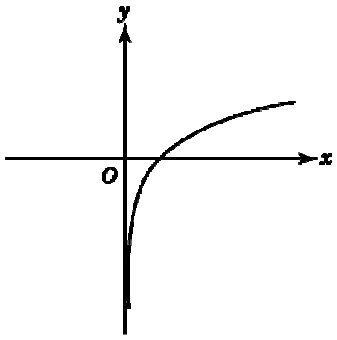
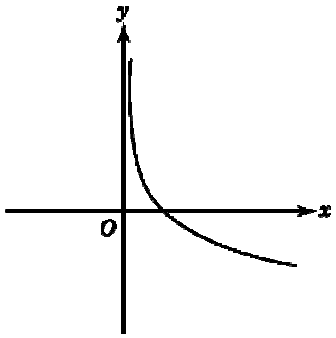
41. Which of the following can be the graph of the function $y = -\log_{\frac{1}{2}} x$?

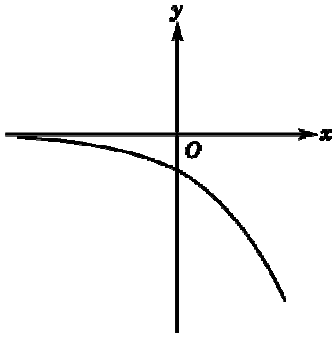
A.



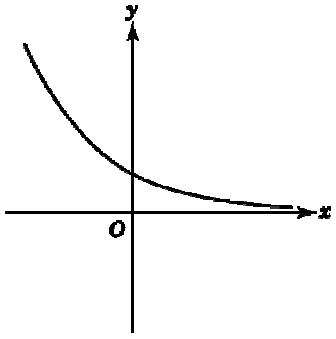
B.



C.



D.



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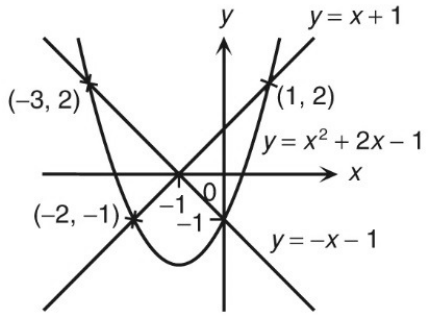
42. Referring to the given figure, which of the following are the solutions of $\begin{cases} y = x^2 + 2x - 1 \\ x - y + 1 = 0 \end{cases}$?



I. (–3, 2)
II. (–2, –1)
III. (–1, 0)
IV. (0, –1)
V. (1, 2)

A. II only
B. III only
C. I and IV only
D. II and V only

43. Find the minimum value of k such that the simultaneous equations $\begin{cases} y^2 - 5x^2 = k \\ y = 3x - 2 \end{cases}$ have real solutions.

A. –10
B. 10
C. –5
D. 5

44. Solve $\frac{1}{(x-2)^2} + \frac{2}{x-2} - 24 = 0$.

A. $x = 2$ or 24
B. $x = -6$ or 4
C. $x = \frac{9}{4}$ or 24
D. $x = \frac{11}{6}$ or $\frac{9}{4}$

45. Solve $9^x = 3^{x+2} - 8$.

A. $x = 1$, 2 or 3
B. $x = 0$ or 1
C. $x = 0$ or $\frac{3\log 2}{\log 3}$
D. $x = \log 3$ or $3\log 2$

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